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Pellet stability, hardness influence feed consumption of Pacific white shrimp

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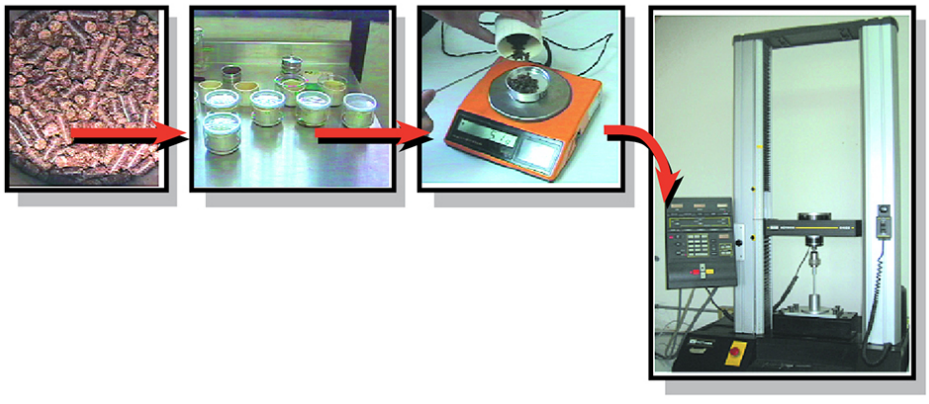
Study evaluates water absorption and percentage loss of dry matter due to leaching



Feed was hydrated in sea water for one hour before weighing and hardness analysis.

The use of binder agents in feeds to increase their stability in water can affect feed consumption. It is important to ensure good feed ingestion rates to obtain maximum growth, while minimizing nutrient leaching.

The authors recently conducted a study at the Mariculture Program of the Universidad Autónoma de Nuevo León in Mexico to determine if the consumption of steam-pelleted feeds was affected by the use of different natural or synthetic binder agents.

Feed study

The feeds were manufactured at a commercial feed manufacturing plant in Ecuador using standard steam-pelleting techniques. Formulation of all diets was identical except for the nature and inclusion rate of the binders, which were added in substitution for part of the wheat middlings (Table 1).

Cerecer-Cota, Composition of the experimental feeds, Table 1

Ingredient	Wheat Gluten 0.3	Synthetic Binder 0.6	Kelp Meal 3.5	No Binder
Whole wheat meal	30	30	30	30
Fishmeal	20	20	20	20
Wheat middlings	19.7	19.4	16.5	20
Rice polishings	10	10	10	10
Feather meal	8	8	8	8
Fish oil	6	6	6	6
Soybean meal	2	2	2	2
Vitamin and mineral mix	3.5	3.5	3.5	3.5
Soy lecithin	0.5	0.5	0.5	0.5

Table 1. Composition of the experimental feeds (% as mixed).

A feeding trial was carried out over a 28-day period with juvenile Pacific white shrimp (*Litopenaeus vannamei).* Four replicate tanks containing 10 animals each were used for each feed. The shrimp were fed twice daily using feed trays. Feed consumption was evaluated using a quantitative method in which the dry weight of consumed feed was corrected by subtracting the loss of dry matter estimated after a one-hour immersion of the pellets in sea water.

Pellet physical characteristics

Pellet water absorption and the percentage loss of dry matter due to leaching were determined using standard techniques. The hardness of both dry and wet pellets was analyzed with a texturometer using a method developed in collaboration with researchers at the University of Sonora, Mexico. Hardness was expressed as the maximum force needed to cause a given deformation.

Diet/consumption correlations

The addition of different binder agents to the feeds changed the capacity of the feeds to absorb water as well as feed consumption by shrimp (Table 2). An inverse relationship was found between water absorption and pellet hardness.

Cerecer-Cota, Physical properties and consumption, Table 2

Property	Wheat Gluten 3.0	Synthetic Binder 0.6	Kelp Meal 3.5	No Binder
Water absorption (%, after 60 minutes)	140 ± 3^{b}	114 ± 1^{a}	139 ± 1^{b}	153 ± 16^{b}
Dry matter loss (%, after 60 minutes in water)	7.5 ± 0.4^{c}	2.6 ± 0.2^{a}	6.3 ± 0.2^{b}	10.4 ± 0.3^{d}
Wet pellet hardness (Kgf, after 60 minutes in water)	1.06 ± 0.11^{b}	1.75 ± 0.17^{c}	0.96 ± 0.20^{ab}	0.76 ± 0.05^{a}
Dry pellet hardness (Kgf)	106 ± 10^{b}	88 ± 4^{a}	96 ± 8^{a}	90 ± 6^{a}
Individual consumption (g dry matter)	0.78 ± 0.12^{a}	0.50 ± 0.18^{b}	0.74 ± 0.12^{a}	0.83 ± 0.04^{a}
Individual consumption (g dry matter, corrected)	0.72 ± 0.11^{a}	0.49 ± 0.18^{b}	0.69 ± 0.11^{a}	0.75 ± 0.03^{a}

Table 2. Physical properties and consumption of the experimental, commercial type, pelleted shrimp feeds.

The control feeds, manufactured without a binder agent, had the best water absorption capacity and highest loss of dry matter, but were the most consumed feeds. The feeds containing synthetic urea-formaldehyde as a binder agent were the hardest after being immersed in sea water, but also the least consumed.

When feed consumption was correlated with the physical parameters, high correlation coefficients were found (Figs. 1-3). Wet pellet hardness was inversely correlated with consumption.

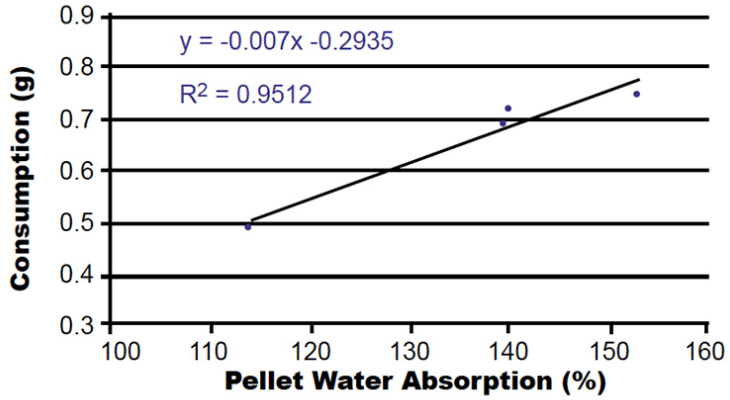


Fig 1: Correlation between corrected individual consumption at 28 days and pellet water absorption for the experimental feeds.

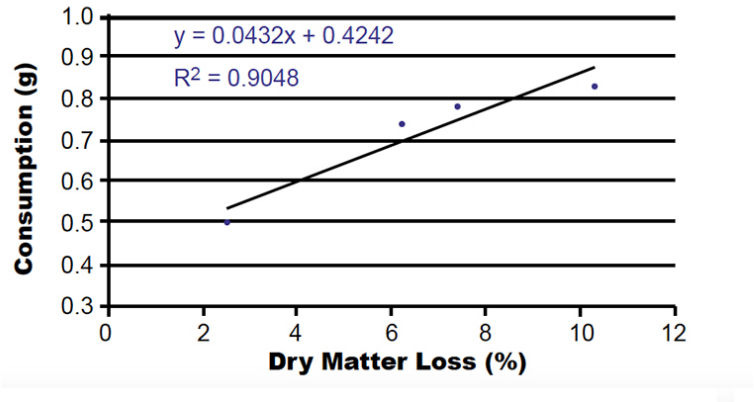


Fig. 2: Correlation between corrected individual consumption at 28 days and pellet dry matter loss for the experimental feeds.

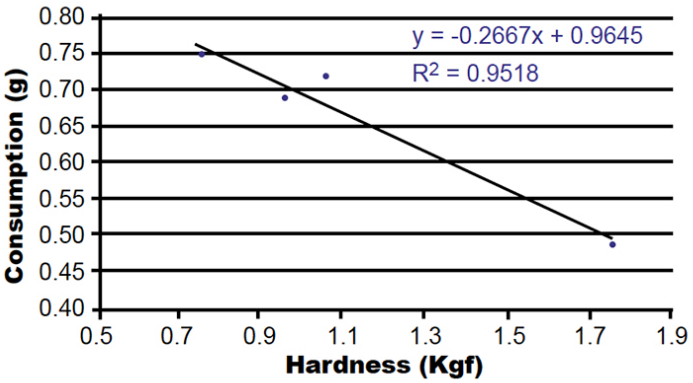


Fig. 3: Correlation between corrected indi-vidual consumption at 28 days and wet pellet hardness for the experimental feeds.

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